MODEL 1-D

1∅ DIGITAL OSCILLATOR

OPERATIONS AND SERVICE MANUAL

PACIFIC

POWER SOURCE CORP.

CERTIFICATION

Pacific Power Source Corporation certifies that this instrument was thoroughly tested and inspected and found to meet or excel its published specifications when it was shipped from the facility.

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Pacific Power Source Corporation warrants each unit to be free from defects in material and workmanship. For the period of two years after purchase, Pacific Power Source Corporation will repair or replace any unit returned to our plant in Huntington Beach, California, by the original buyer, with shipping both ways prepaid by the buyer. Pacific Power Source Corporation is not responsible for consequential damage arising from the use of its equipment.

1-D DIGITAL PLUG-IN OSCILLATOR

OPERATIONS AND SERVICE MANUAL

PACIFIC PART NO. 108750

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PACIFIC POWER SOURCE CORPORATION
5312 SYSTEMS DRIVE
HUNTINGTON BEACH, CALIFORNIA 92649

1 NOV 1978

FIRST EDITION

MODEL 1-D DIGITAL OSCILLATOR PLUG-IN

TABLE OF CONTENTS

1.0 GENERAL DESCRIPTION

1.1 General Characteristics

1.2 Performance Specifications

1.3 Operating Characteristics

2.0 TECHNICAL DESCRIPTION

2.1 Theory of Operation

2.1.1 Parts List

2.2 Oscillator Card Assembly

2.2.1 Theory of Operation
2.2.2 Parts List

2.3 Display Card Assembly

2.3.1 Theory of Operation
2.3.2 Parts List

2.4 Switch Card Assembly

2.4.1 Theory of Operation
2.4.2 Parts List

3.0 CALIBRATION AND ALIGNMENT

4.0 MAINTENANCE AND REPAIR

5.0 ENGINEERING MODIFICATIONS

MODEL 1-D DIGITAL OSCILLATOR PLUG-IN

LIST OF ILLUSTRATIONS

FIGURE	2.1A	SYSTEM BLOCK DIAGRAM
	2.1B	SYSTEM ASSEMBLY DRAWING
	2.2A	OSCILLATOR CARD SCHEMATIC DIAGRAM
	2.2B	OSCILLATOR CARD ASSEMBLY DRAWING
	2.3A	DISPLAY CARD SCHEMATIC DIAGRAM
	2.3B	DISPLAY CARD ASSEMBLY DRAWING
	2.4A	SWITCH CARD SCHEMATIC DIAGRAM
	2.4B	SWITCH CARD ASSEMBLY DRAWING

1.0 GENERAL DESCRIPTION

1.1 General Characteristics

All single Ø "K" series Pacific AC Power Sources with a "D" in the model number suffix utilize the 1-D Digital Oscillator plug-in. This oscillator generates digitally-synthesized sine waves of exceptional quality and features two digital meters for both voltage and frequency readout.

The digital oscillator generates a single phase vector from a high frequency clock; since this vector is generated from a programmed memory, there is no amplitude imbalance when shifting frequency. The plug-in includes two 3½ digit LED displays; the first monitors frequency continuously, the other is switch selectable to read volts or amps.

Special frequency control ranges and digital control interface can be supplied to meet user requirements; refer to section 5 of this manual if your machine has been modified.

1.2 Performance Specifications

Frequency Control: Two continuously variable ranges 20-200 and 200-2000 Hz, plus three precision fixed frequencies at 50,60,400 Hz, or at other user specified frequencies.

NOTE: Units with internal autoformer: Model numbers with suffix D will have the low frequency range restricted to 45 Hz and the high frequency range restricted to 500 Hz.

Amplitude Control: Continuously variable 0 to V max.

Signal Distortion: 0.25% max.

Amplitude Stability: 0.01% per ^{o}C.

Frequency Stability: 0.01% per ^{o}C.

Freq. Meter Accuracy: 0.25% $\pm$ 1 digit

Freq. Meter Resolution: 0.1 Hz on 20-200 range
1.0 Hz on 200-2000 range

Voltmeter Accuracy: 0.25% $\pm$ 1 digit

Ammeter Accuracy: 5.0%

1.3 Operating Characteristics

The 1-D plug-in is well suited for applications requiring quality power and versatility. Multi-turn precision controls and digital monitoring of all parameters combine to allow precise setting of output voltage and frequency.

1.3.1 Frequency Selection

The mode of operation is selected by the "Frequency Select Switch". A choice of preset frequencies of 50, 60, or 400 Hz or variable control ranges of 20-200 and 200-2000 Hz is made by this switch as well as any special frequencies or ranges that may have been installed. In the variable ranges, the frequency is set by the "Frequency Adjust" control. There is little voltage change when changing frequency.

1.3.2 Voltage Adjustment

The output voltage is set by the multi-turn "Voltage Adjust" control, which will vary the output from 0 to rated output voltage.

1.3.3 Digital Displays

Dual 3½ digit displays monitor output voltage and frequency. Range scaling is automatically accomplished in the frequency switch.

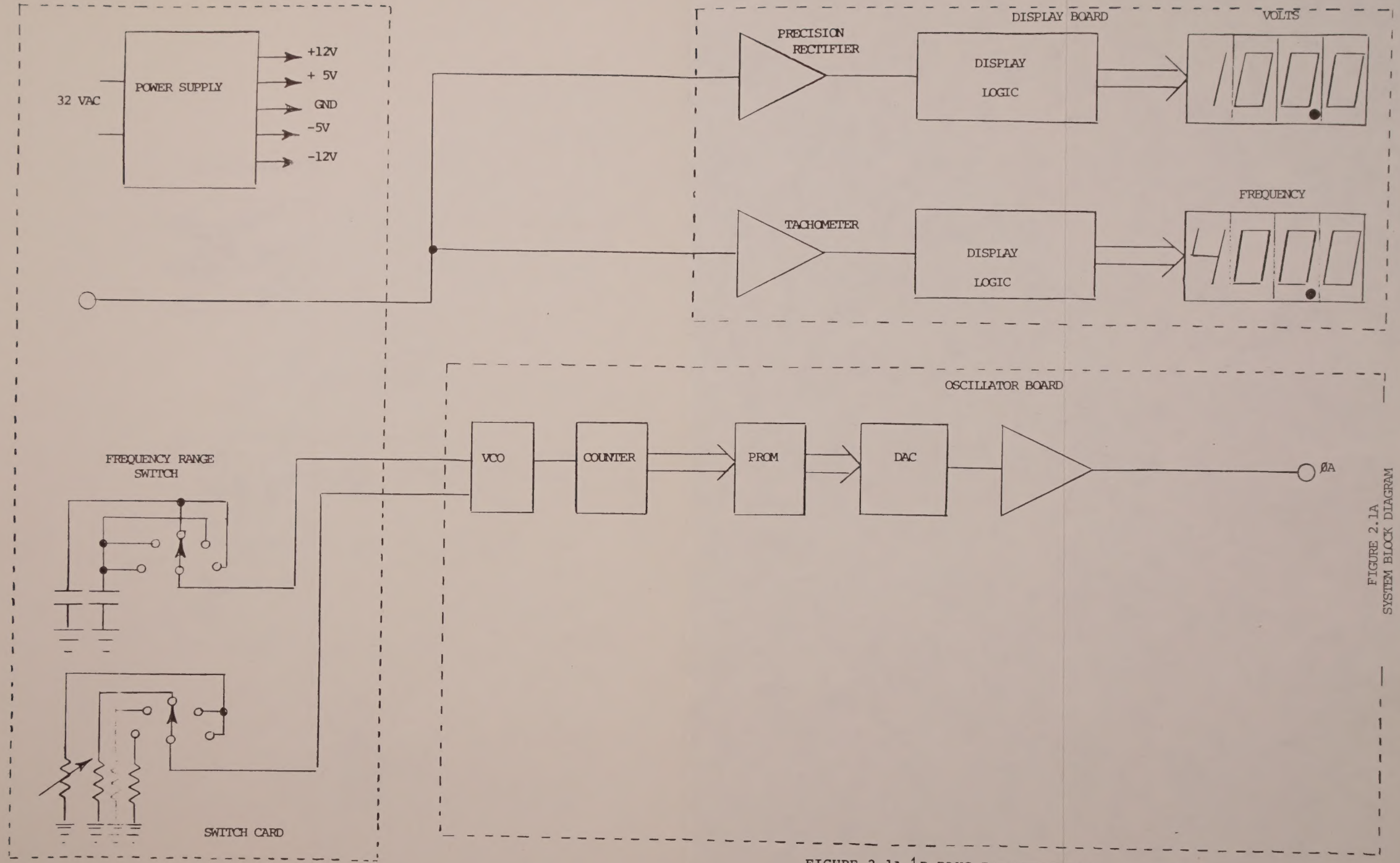


FIGURE 2.1A
SYSTEM BLOCK DIAGRAM

FIGURE 2.1A 1D PLUG-IN SYSTEM BLOCK DIAGRAM

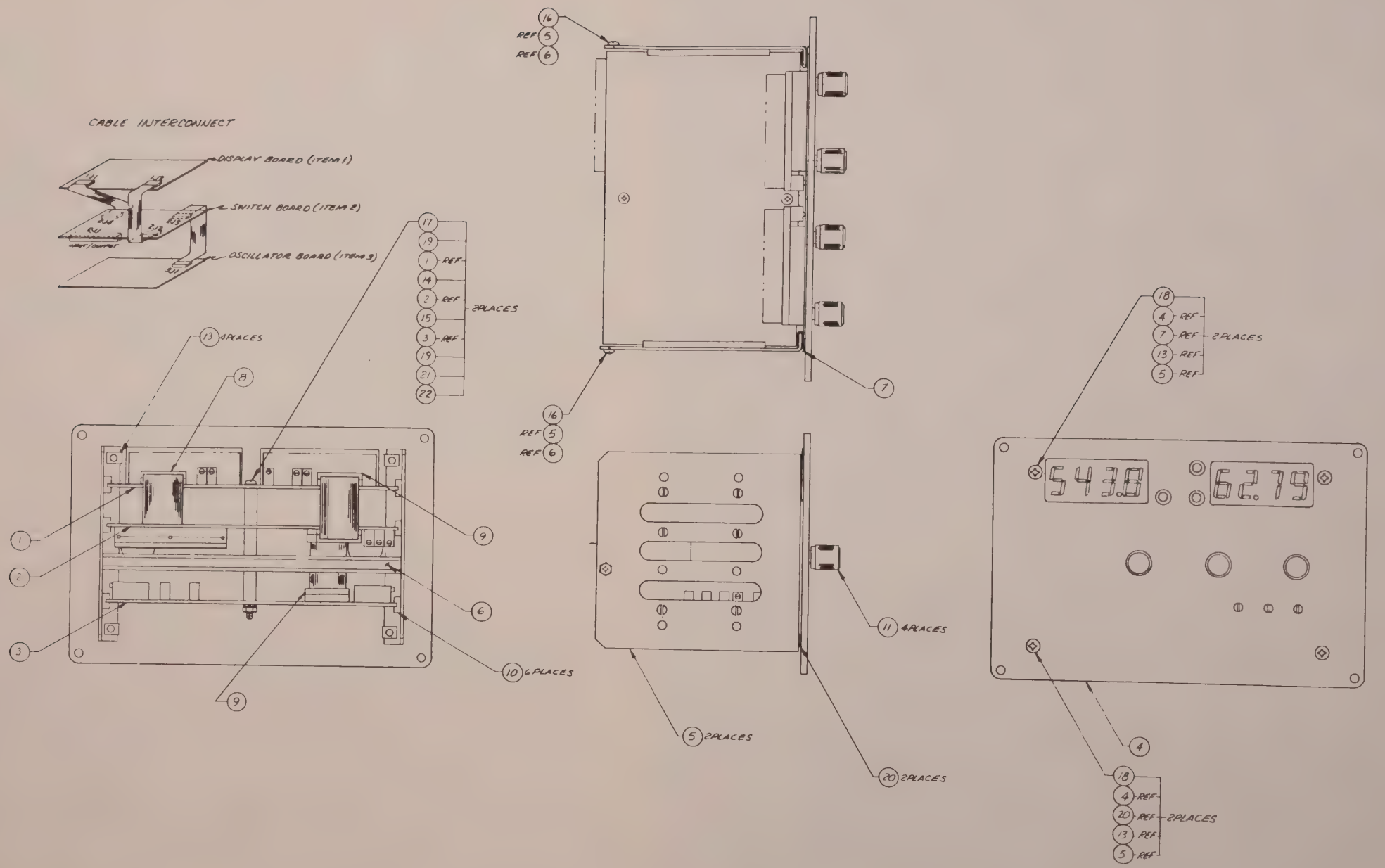


FIGURE 2.1B
SYSTEM ASSEMBLY DRAWING

2.0 TECHNICAL DESCRIPTION

2.1 Theory of Operation

The oscillator portion of the 1-D plug-in uses the principal of counting through cycles of a memory to generate a binary word weighted with a sine bit function; a digital-to-analog converter converts this word into a smooth sine-wave. To control the output voltage, it is necessary only to vary the DAC reference voltage. Frequency control is accomplished by selection of the timing components of the clock generator.

The display portion features two identical 3½ digit DVM's with 0-2VDC input. The frequency counter uses a precision tachometer and low pass filter to measure the signal frequency and the voltage portion uses a precision rectifier to convert the selected AC to DC. All range-scaling is done on the switch card assembly.

The switch card assembly performs all range-scaling and voltage and frequency selection with printed circuit mounted switches and controls. The low voltage power supplies are also located on this card.

2.2 Oscillator Card Assembly

2.2.1 Theory of Operation

Refer to Figures 2.1A, 2.2.1A and 2.2.1B and section 2.1 of this manual, along with this technical description.

Voltage controlled oscillator Z1 generates a clock signal at 512 times the output frequency; the resistance from Z1-6 to ground and the capacitor from Z1-Z to Z1-3 determine this frequency. These parts are located on the switch card assembly. Z2 and Z3 form an 8-bit counter to drive memory Z4. The memory is programmed with one-half a sine wave; this memory feeds a current-to-voltage converting amplifier which outputs positive going, full-wave rectified signals. These are inverted and switches driven by the sine bit alternate half-cycles to generate a clean sinewave.

Amplifier A3 is a buffer to the clock noise filter and scales the voltage to the desired output level.

PARTS LIST 1-D 1Ø DIGITAL SIGNAL GENERATOR DRAWING NO. 1087004

ITEM	DESCRIPTION	MFG P/N	MFG	QTY
01	DISPLAY ASSEMBLY	108361	PEE	1
02	CONTROL SWITCH ASSEMBLY	108761	PEE	1
03	OSCILLATOR CIRCUIT ASSY	108760	PEE	1
04	FRONT PANEL	108301	PEE	1
05	SIDE PANEL	108302	PEE	2
06	STANDOFF #4.40 x 6.06 Long	108304	PEE	1
07	LENS	108303	PEE	1
08	CABLE ASSY #1	570005	PEE	1
09	CABLE ASSY #2	570006	PEE	2
10	CARD GUIDE	1250F	SAE	6
11	KNOB	KN-501B-1/8	ALCO	3

PARTS LIST 1-D OSCILLATOR CIRCUIT ASSEMBLY DRAWING NO. 108760-0

ITEM	DESCRIPTION	MFG P/N	MFG	QTY
	OSCILLATOR PRINTED CIRCUIT BRD	PC108362	PEE	1
	OPERATIONAL AMPLIFIER A1-3	LM741C	PEE	3
	CAPACITOR, .01 µf @ 50V C2,4,6	2CO23103D8500C4	SPRAGUE	3
	CAPACITOR 68 pf @500V C7	CMO4ED68&JO3	ARCO	1
	CAPACITOR .47 µf @50V C1,3	2CO23474D8500C4	SPRAGUE	2
	TRANSISTOR Q1,3	2N2219		2
	TRANSISTOR Q2	2N2905		1
	RESISTOR 1.8KΩ -1/8W,1% R15, 21,23	RN55C1801		3
	RESISTOR, 3.92KΩ1/8W,1% R3	RN55C3921		1
	RESISTOR, 5.11KΩ1/8W,1% R2	RN55C5111		1
	RESISTOR, 10KΩ 1/8W,1%, R24,30	RN55C1002		2
	RESISTOR, 10.5KΩ ,1/8W,1%, R26	RN55C1052		1

ITEM	DESCRIPTION	MFG P/N	MFG	QTY
	RESISTOR, SAT, 1/8W,1% R31			1
	RESISTOR, 100Ω,¼W,5% R6,22			2
	RESISTOR, 1KΩ ¼W,5%, R1			1
	RESISTOR, 5.1KΩ ¼W,5%, R4,5,7-14			10
	RESISTOR, 10KΩ ¼W,5%, R4,5,16-20,27			8
	RESISTOR, 100KΩ ¼W,5%,R28,29			2
	POTENTIOMETER, 1KΩ R25	3009P-102	Bourns	1
	INTEGRATED CIRCUIT Z6	CD4016	RCA	1
	INTEGRATED CIRCUIT Z5	1408L	PMI	1
	INTEGRATED CIRCUIT Z4	540128	PEE	1
	INTEGRATED CIRCUIT Z1	XR2207	EXAR	1
	INTEGRATED CIRCUIT Z2,3	CD4029	RCA	2
	SOCKET CABLE 3J1	516-AG10D	AUGAT	1
	CAPACITOR .001 µf @500V C5	5GA D10	SPRAGUE	1

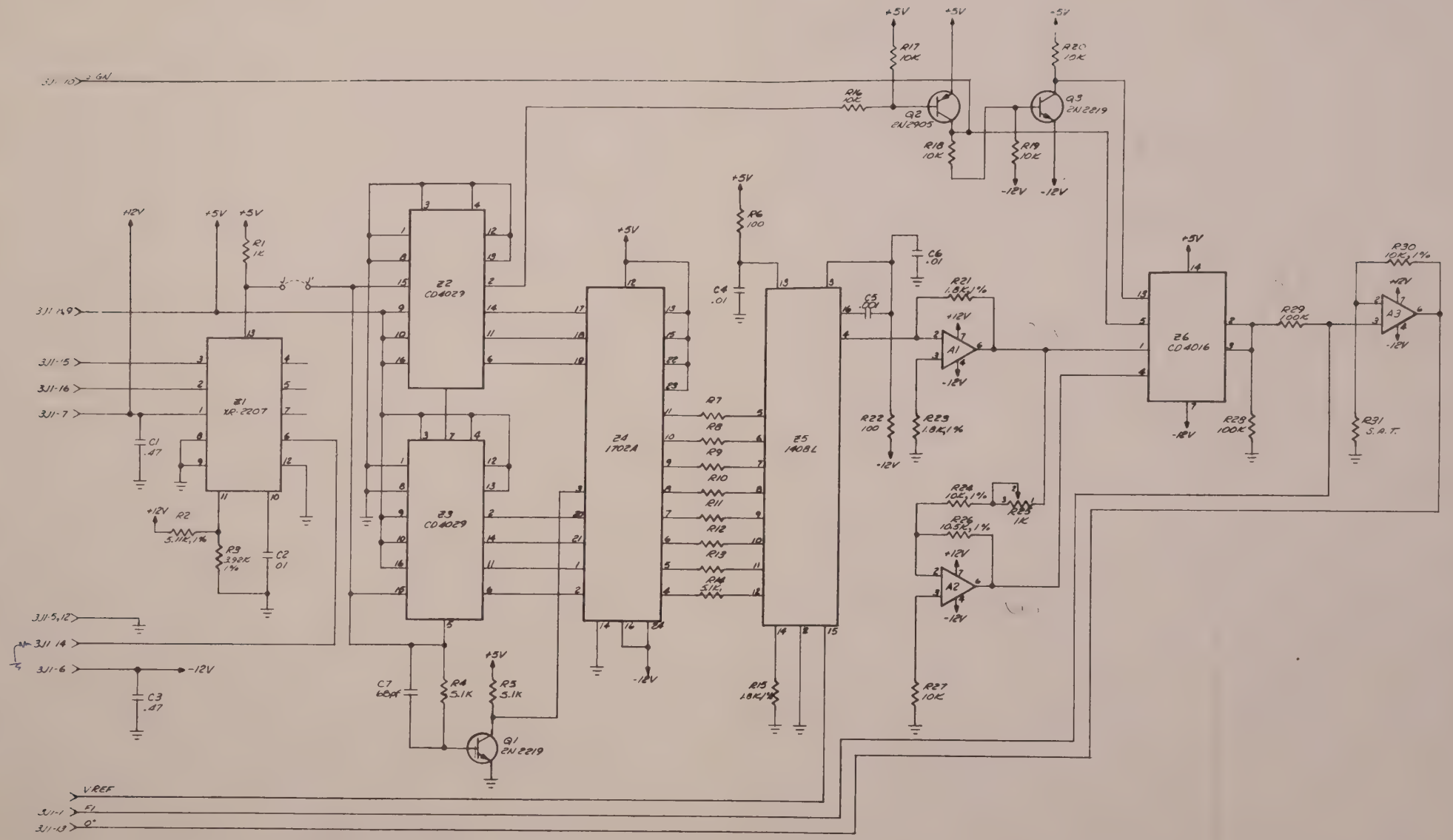


FIGURE 2.2A
OSCILLATOR CARD SCHEMATIC DIAGRAM

NOTES: UNLESS OTHERWISE SPECIFIED.
1. ALL RESISTOR VALUES ARE IN OHMS, 1/4 W, 5%.
2. ALL CAPACITOR VALUES ARE IN Mfd.

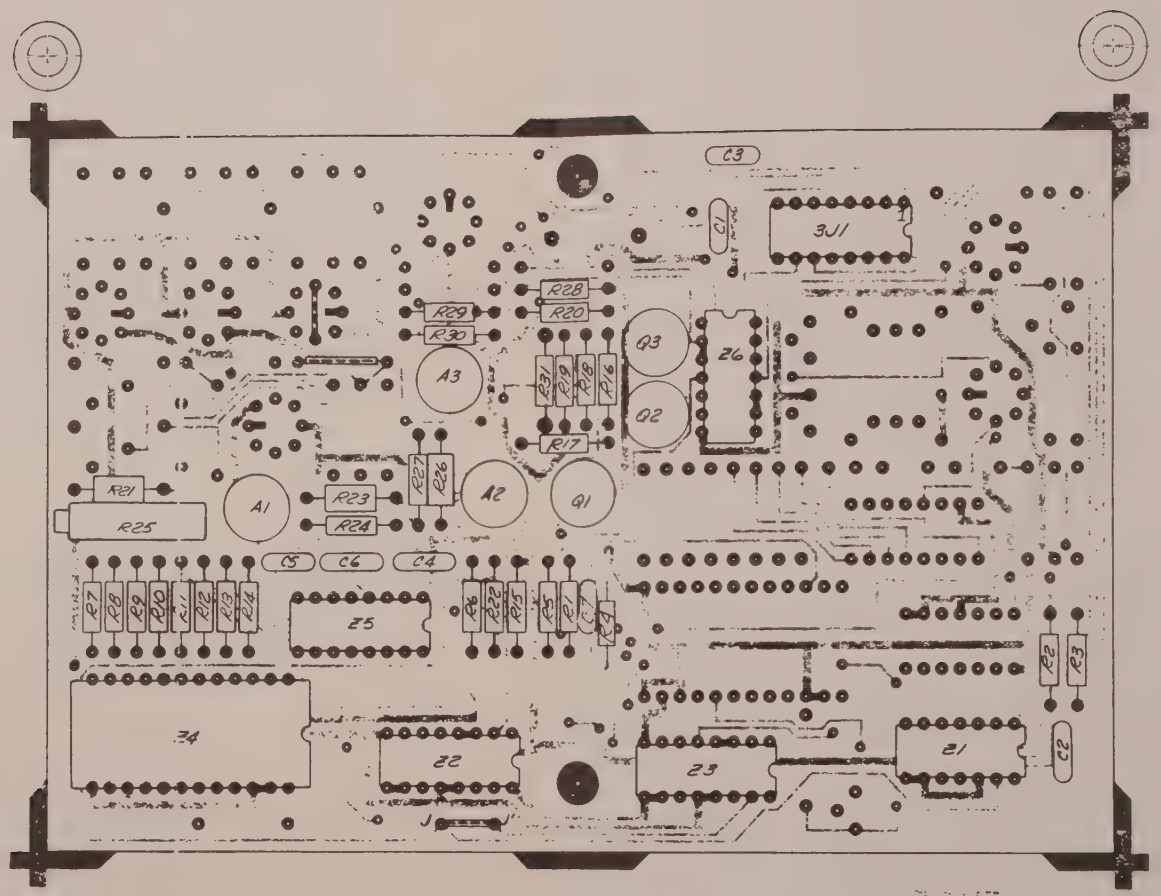


FIGURE 2.2B
OSCILLATOR CARD ASSEMBLY DRAWING

2.3 Display Card Assembly

Refer to Figures 2.1A, 2.3.1 and 2.3.1B and section 2.1 of this manual along with this technical description.

The display portions of this card are identical and consist of a 3½ digit analog-to-digital logic sub-system formed by Z3-Z4 and Z8-Z9, BCD-to-Seven Segment decoders Z5 and Z10, and LED drivers Z6-Z7 and Z11-Z12.

The display is conventional dual-slope integration method with a 1-4Hz update rate; please refer to the manufacturer's specs for complete details of circuit operation. Each display has a zero and a full scale adjustment. The frequency channel uses a precision tachometer circuit Z1-Z2 and filters to generate a DC voltage proportional to frequency. It is range-scaled automatically by the Frequency Select switch.

The voltage channel uses a differential amplifier A3 and precision rectifier A4 to generate a DC voltage proportional to the voltage selected by the meter select switch.

2.4 Switch Card Assembly

2.4.1 Theory of Operation

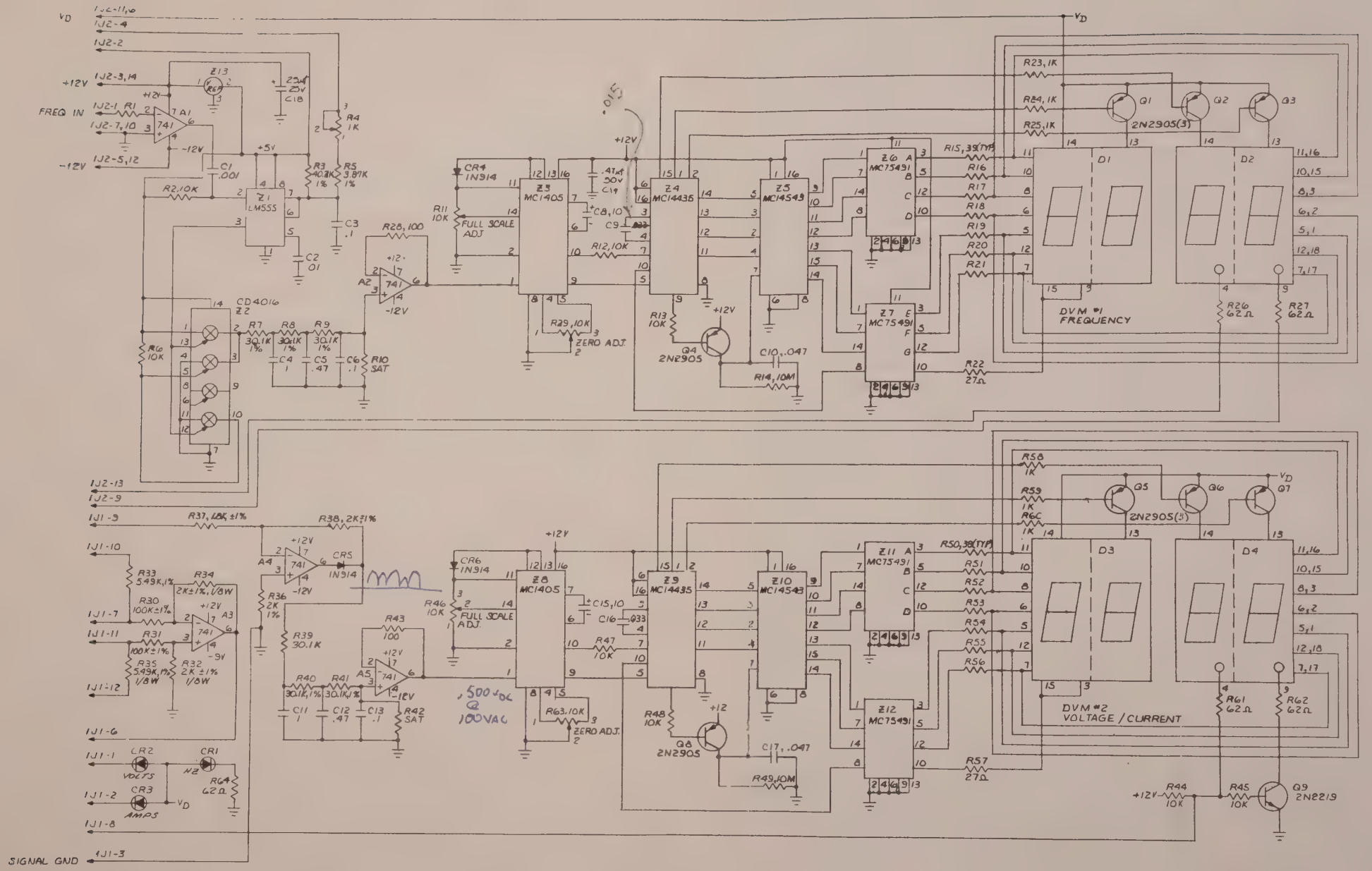
The switch card assembly performs all range-scaling and frequency selection; it also contains all low voltage power supplies.

A six-hole, nine position PC mounted switch is located on the switch card assembly. Switch S1 controls the frequency ranges.

S1-A, oscillator timing
S1-B, 0^{O} filter
S1-C,
S1-D, display scaling
S1-E, display decimal point
S1-F, oscillator timing resistor

The switch card will normally be hard wired for a voltage display range of 0-199.9 volts. For special applications, it may be converted to 0-1999 volts.

The power supply section consists of a full-wave bridge rectifier and filter and four integrated circuit regulator chips Z1 - Z4. Unfiltered display voltage is regulated by Q1.



1. C7 & C14 NOT USED.
NOTE: UNLESS OTHERWISE SPECIFIED

FIGURE 2.3A
DISPLAY CARD SCHEMATIC DIAGRAM

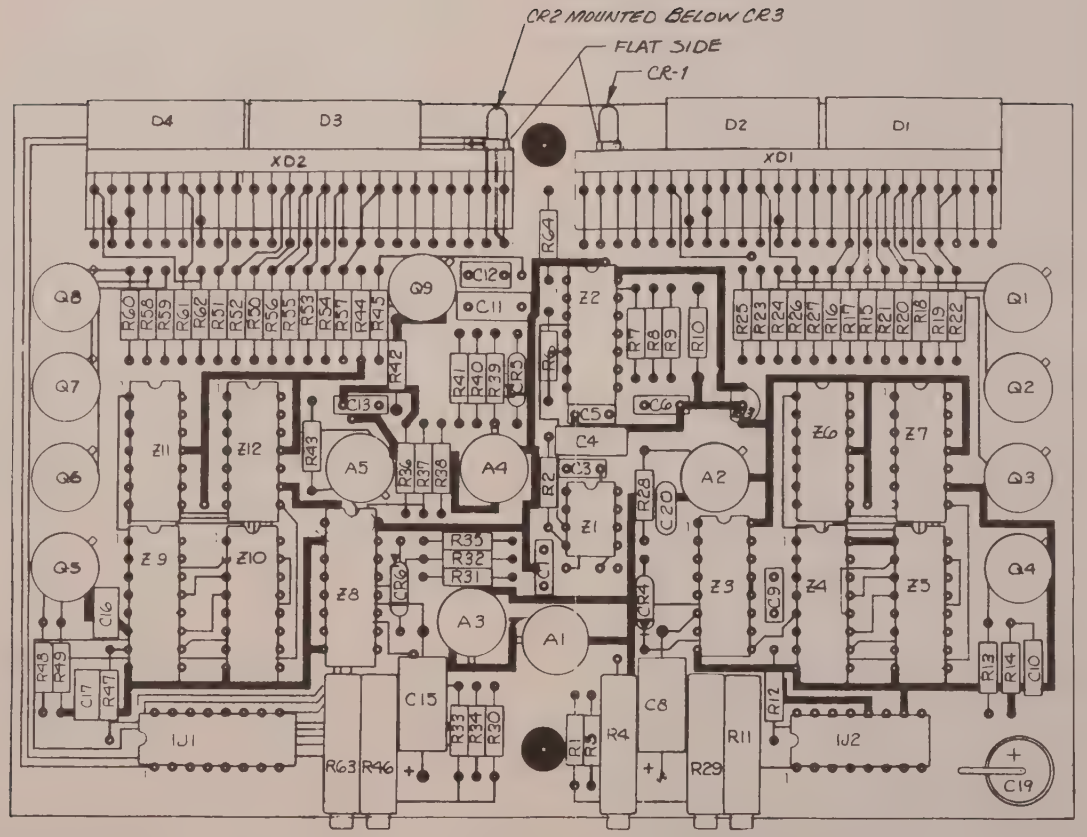


FIGURE 2.3B
DISPLAY CARD ASSEMBLY DRAWING

PARTS LIST DISPLAY ASSY DRAWING NO. 108361-1

ITEM	DESCRIPTION	MFG P/N	MFG	QTY
	DISPLAY PRINTED CIRCUIT BRD	PC108361	PEE	1
	OPERATIONAL AMPLIFIER A1-5	LM741C		5
	CAPACITOR, .001 µf @50V C1	1CO67102X0500C4	SPRAGUE	1
	CAPACITOR .01 µf @ 50V C2	2CO23103D8500C4	SPRAGUE	1
	CAPACITOR .033 µf @ 50V C9,16	2CO23333D8500C4	SPRAGUE	2
	CAPACITOR .047 µf @ 50V C10, 17	2CO23473D8500C4	SPRAGUE	2
	CAPACITOR .1µ f @ 50V C3,6,13	730BIC104	ELECTROCUBE	3
	CAPACITOR .47 µf @ 50V C5,12,19	2CO23474D8500C4	SPRAGUE	3
	CAPACITOR 1 µf @ 50V C4,11	3CO23105D8500C5	SPRAGUE	2
	CAPACITOR, 10 µ f @ 25V C8	TE1204	SPRAGUE	1
	LED CR1-3	MV5054-2	MONSANTO	3
	DIODE CR4-6	IN914		3
	TRANSISTOR Q1-8	2N2905		8
	TRANSISTOR Q9	2N2219		1
	RESISTOR, 2KΩ , 1/8W, 1% R32,34,36,38	RN55C2001		4
	RESISTOR, 3.97KΩ R5	RN55C		1
	RESISTOR 30.1KΩ R7-9, 39-41	RN55C3002		6
	RESISTOR 5.49 KΩR33,35	RN55C5502		2
	RESISTOR 100 KΩ 1/8W 1% R30,31	RN55C1003		2
	RESISTOR 27 Ω ¼W 5% R22,57			2
	RESISTOR 39 Ω R15-21,50-56			14

PARTS LIST DISPLAY ASSY DRAWING NO. 108361-

ITEM	DESCRIPTION	MFG P/N	MFG	QTY
	RESISTOR, 62Ω ¼W,5% R26,27, 61-63			5
	RESISTOR, 100Ω ¼W,5% R43, R28			2
	RESISTOR, 1KΩ ¼W,1% R23-25,58-60			6
	RESISTOR, 10KΩ ¼W,5% R2,6,11-13,44-48			10
	RESISTOR, 10MEG Ω R14, 49			2
	RESISTOR, SAT, ¼W,5% R10,42			2
	INTEGRATED CIRCUIT Z1	LM555		1
	INTEGRATED CIRCUIT Z2	CD4016	RCA	1
	INTEGRATED CIRCUIT Z3,8	MC1405	MOT	2
	INTEGRATED CIRCUIT Z4,9	MC14435	MOT	2
	INTEGRATED CIRCUIT Z5,10	MC14543	MOT	2
	INTEGRATED CIRCUIT Z6,7,11, 12	MC75491	MOT	4
	DIGITAL DISPLAY D1-4	MAN6610	MONSANTO	4
	POTENTIOMETER 1 KΩ R4	3009P-1-102	BOURNS	1
	POTENTIOMETER 10K R29,63	3009P-1-103	BOURNS	2
	DISPLAY SOCKET	508-AG8D	AUGAT	12
	EXTRUSION SOCKETS HARDWARE SUPPLIED	508-5P1-6	AUGAT	2
	SOCKET CABLE 1J1, 1J2	516-AG10D	AUGAT	2
	RESISTOR, 40.2 KΩ 1/8W,1% R3	RN55C4021		1
	CAPACITOR 25 µf @ 25V C18	TE-1209	SPRAGUE	1
	RESISTOR 18.2K 1/8W 1% R31			

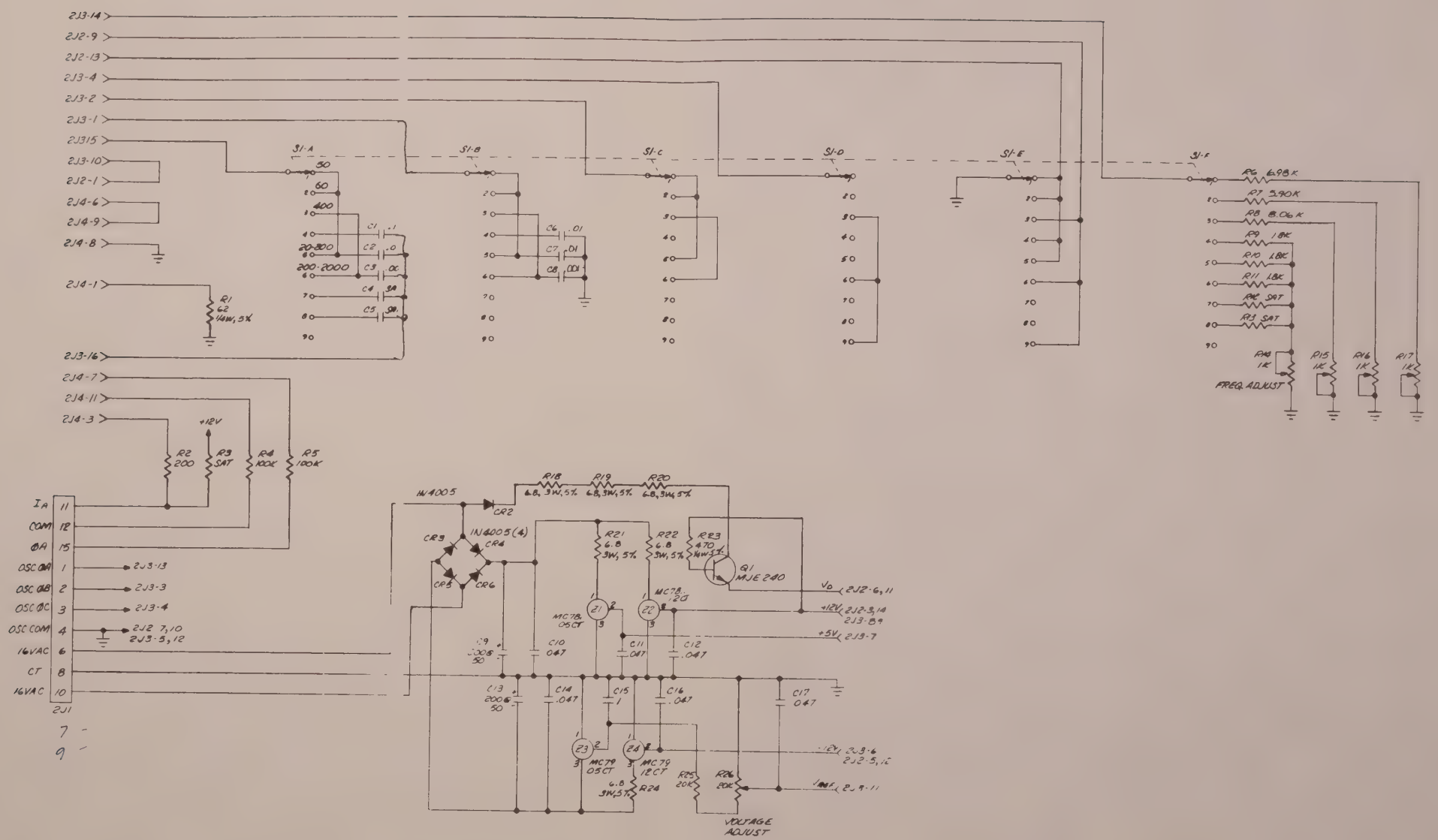
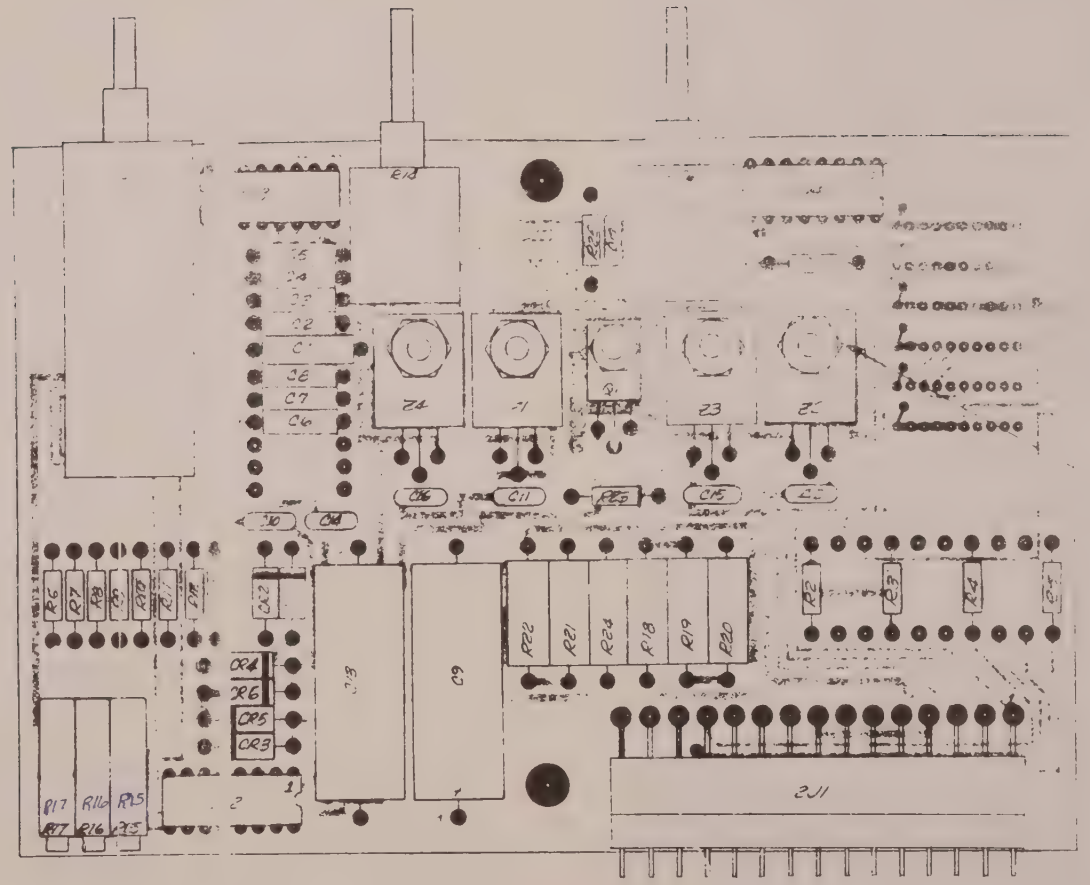


FIGURE 2.4A
SWITCH CARD SCHMATIC DIAGRAM

E. ALL CAPACITOR VALUES ARE IN Mfd.
I. ALL RESISTOR VALUES ARE IN OHMS, 1/4W, ±1%.
NOTES: UNLESS OTHERWISE SPECIFIED



⚠ MOUNT Z1-Z4 & Q1, GOLD SIDE DOWN.

NOTES: UNLESS OTHERWISE SPECIFIED.

ITEM	DESCRIPTION	MFG P/N	MFG	QTY
	CONTROL WWITCH PRINTED CIRCUIT BOARD	PC108360	PEE	1
	CAPACITOR, .001 µf@200V C3,8	730BIC102	ELECTROCUBE	2
	CAPACITOR, .01 µf@200V C2,6,7	730BIC103	ELECTROCUBE	3
	CAPACITOR, .047 µf@50V C10-12-14, 16, 17	2CO23473D8500C4	SPRAGUE	6
	CAPACITOR .1µf @ 200V C1	730B1C104	ELECTROCUBE	1
	CAPACITOR 1 µf @ 50V C15	3CO23105D8500C5	SPRAGUE	1
	CAPACITOR 100 pf @ 1KV C8	5GA-T10	SPRAGUE	1
	CAPACITOR, 200 µf @ 50V C9,13	207GO50FF7	SPRAGUE	2
	DIODE CR2-6	IN4005		5
	TRANSISTOR Q1	MJE240	MOTOROLA	1
	RESISTOR, 200Ω 1/8W,1% R2	RN55C2000		1
	RESISTOR, 1.8KΩ 1/8W,1% R9-11	RN55C1801		3
	RESISTOR, 20KΩ 1/8W,1%,R25	RN55C1002		1
	RESISTOR, 100KΩ 1/8W,1%,R4,5	RN55C1003		2
	RESISTOR, SAT, 1/8W,1%,R3,12,13	RN55CXXXX		3
	RESISTOR, 470Ω ¼W,5%, R23			1
	RESISTOR, 62Ω ¼W,5%, R1			1
	RESISTOR, 6.8Ω ,3W,5% R18-22,24	RS2B	DALE	6
	POTENTIOMETER, 1KΩ R15-17	3009P-102	BOURNS	3
	POTENTIOMETER, 20KΩ R14,26	83C1D-E28-J16	BOURNS	2
	SWITCH-ROTARY S1	71AF36-06-1-9N	GRAYHILL	1

ITEM	DESCRIPTION	MFG P/N	MFG	QTY
	VOLTAGE REGULATOR Z1	MC7805CT	MOT	1
	VOLTAGE REGULATOR Z2	MC7812CT	MOT	1
	VOLTAGE REGULATOR Z3	MC7905CT	MOT	1
	SCREW, 4-40 x ½, PAN HD PHILL			5
	WASHER, SPLIT LOCK #4			5
	CONNECTOR (15 PIN MALE) 2J1	09-64-1151	MOLEX	1
	SOCKET, CABLE 2J2, 2J3, 2J4	516-AG10D	AUGAT	3
	RESISTOR, 6.98 KΩ ,1/8W,1% R6	RN55C6981		1
	RESISTOR, 5.90 KΩ ,1/8W,1% R7	RN55C5901		1
	RESISTOR, 8.06 KΩ ,1/8W,1% R8	RN55C8061		1
	VOLTAGE REGULATOR Z4	MC79 12CT	MOTOROLA	1

3.0 CALIBRATION AND ALIGNMENT

3.1 Requirements

Pacific Power Source Corporation recommends the calibration procedure to be performed at six-month intervals or if the unit has undergone major repairs. All adjustments fall into the categories of either oscillator or display calibration.

3.2 Oscillator Calibration

3.2.1 Frequency Calibration

All frequency calibration components are located on the switch card assembly. Using a counter attached to the output terminals, make the following adjustments on the switch card.

3.2.1.1 Set the Frequency Select switch to 50Hz and adjust R17 until the frequency is 50 ±.1 Hz.

3.2.1.2 Set the Frequency Select Switch to 60 Hz and adjust R16 until the frequency is 60±.1Hz.

3.2.1.3 Set the Frequency Select Switch to 400 Hz and adjust R15 until the frequency is 400 ±.5Hz.

3.3 Display Calibration

3.3.1 Frequency Display Calibration

Set Frequency Select Switch to 60Hz position and connect a counter across the output terminals; adjust R11 on the display board until display matches the counter within ±.1 Hz.

Change Frequency Select Switch to 400 Hz and adjust R4 until display reading matches the counter within ±1 Hz.

3.3.2 Voltmeter Calibration

Set output of ØA to 100 ±.1 V as measured with an external DVM. Adjust R46 for a display reading of 100 ±.1V.

4.0 MAINTENANCE AND REPAIR

4.1 Disassembly

Refer to Figure 2.1A for assembly illustration. Remove the three knobs (items 11) and the card retaining stand-offs. The three cards can then be slid out of the card cage and laid flat on a work bench for troubleshooting.

5.0 ENGINEERING MODIFICATIONS